CLAIMS

1. A tomosynthesis method for creating a three-dimensional reconstruction of a target element volume comprising:

acquiring radiation absorbance images of the target element volume through a limited plurality of angles;

dividing the target element volume into a plurality of volume segments;

applying a reconstruction algorithm to each segment to generate a three-dimensional reconstruction of each volume segment; and

merging the three-dimensional reconstruction of each volume segment to create a three-dimensional reconstruction of the target volume.

2. The method of claim 1, wherein the volume segments overlap.

3. The method of claim 2, wherein the volume segments overlap by an amount sufficient to result in a three-dimensional reconstruction of the target volume that does not differ substantially in quality from an unsegmented reconstruction.

4. The method of claim 3, wherein the value of a majority of the pixels in the three-dimensional reconstruction of the target volume differ by less than about 1% from pixels in the unsegmented reconstruction.

5. The method of claim 2, wherein the volume segments overlap by between about 0 and 50 per cent.

6. The method of claim 1, wherein the volume segments comprise volume segments having a complex shape that is dependent upon the acquisition geometry and makes the reconstruction of each segment independent of the reconstruction of any other segment.

7. The method of claim 1, wherein the volume segments comprise volume segments having a slanted rectangular shape so that the reconstruction of each segment is independent of the reconstruction of any other segment.

8. The method of claim 1, wherein the images are obtained using an image acquisition element having:

a radiation source positionable at a plurality of positions with respect to the target element; and

a radiation detector positioned so as to detect radiation emitted by the radiation source passing through the target element and determine a plurality of attenuation value for radiation passing through the target element to establish a radiation absorbance projection image of the target element for a particular radiation source position.

9. The method of claim 8, wherein the radiation source is positionable at a plurality of angles in a first plane.

10. The method of claim 9, wherein the volume segments comprise volume segments having a slanted rectangular shape and having a base that corresponds to a plurality of consecutive detector pixel rows that are parallel to and spaced apart from the first plane, each slanted rectangular volume segment extending from its base in a direction toward the radiation source.

11. The method of claim 9, wherein the method is deployed in mammography.

12. The method of claim 11, wherein the first plane is substantially parallel to a patient's chest wall.

13. The method of claim 12, wherein the volume segments comprise volume segments having a slanted rectangular shape and having a base that corresponds to a plurality of consecutive detector pixel rows that are parallel to and space apart from the patient's chest wall, each slanted rectangular volume segment extending from its base in a direction toward the radiation source.

14. The method of claim 1, wherein the method is carried out using a plurality of processors with at least one segment reconstruction being carried out using a first processor of the plurality of processors and at least one segment reconstruction being carried out using a second processor of the plurality of processors.

15. The method of claim 14, wherein each segment reconstruction is carried out using a different processor of the plurality of processors.

16. A system for three-dimensional tomosynthesis imaging of a target element comprising:

an image acquisition element for obtaining a plurality of images of the target element from a plurality of angles having:

a radiation source positionable at a plurality of positions with respect to the target element; and

a radiation detector positioned so as to detect radiation emitted by the radiation source passing through the target element and determine a plurality of attenuation value for radiation passing through the target element to establish a radiation absorbance projection image of the target element for a particular radiation source position; and

a processor configured to apply a reconstruction algorithm to the radiation absorbance projection images of the target element obtained from a plurality of radiation source angles to generate a three-dimensional reconstruction of the target element wherein the processor is further configured to divide the target volume into a plurality of image reconstruction volume segments for separate image reconstruction of the volume segments and mergence of the reconstructed volume segments into a three-dimensional reconstruction of the target element.

17. The system of claim 16, wherein the system comprises a plurality of processors with at least one segment reconstruction being carried out using a first processor of the plurality of processors and at least one segment reconstruction being carried out using a second processor of the plurality of processors.

18. The method of claim 17, wherein the system comprises a number of processors that is at least equal to the number of image reconstruction volume segments that the system divides the target volume into and each segment reconstruction is carried out using a different processor of the plurality of processors.

19. The system of claim 16, wherein the volume segments overlap.

20. The system of claim 19, wherein the volume segments overlap by an amount sufficient to result in a three-dimensional reconstruction of the target volume that does not differ substantially in quality from an unsegmented reconstruction.

21. The system of claim 20, wherein the value of a majority of the pixels in the three-dimensional reconstruction of the target volume differ by less than about 1% from pixels in the unsegmented reconstruction.

22. The system of claim 19, wherein the volume segments overlap by between about 0 and 50 per cent.

23. The system of claim 16, wherein the volume segments comprise volume segments having a complex shape that is dependent upon the acquisition geometry and makes the reconstruction of each segment independent of the reconstruction of any other segment.

24. The system of claim 16, wherein the radiation source is positionable at a plurality of angles in a first plane with respect to the target element.

25. The system of claim 24, wherein the volume segments comprise volume segments having a slanted rectangular shape so that the reconstruction of each segment is independent of the reconstruction of any other segment.

26. The system of claim 24, wherein the volume segments comprise volume segments having a slanted rectangular shape and having a base that corresponds to a plurality of consecutive detector pixel rows that are parallel to and spaced apart from the first plane, each slanted rectangular volume segment extending from its base in a direction toward the radiation source.

27. The system of claim 24, wherein the system is configured to be deployed in mammography.

28. The system of claim 27, wherein the first plane is substantially parallel to a patient's chest wall.

29. The system of claim 28, wherein the volume segments comprise volume segments having a slanted rectangular shape and having a base that corresponds to a plurality of consecutive detector pixel rows that are parallel to and space apart from the patient's chest wall, each slanted rectangular volume segment extending from its base in a direction toward the radiation source.

30. A computer program for three-dimensional tomosynthesis imaging of a target element volume from a plurality of radiation absorbance projection images obtained from different positions from an image acquisition element having a radiation source positionable at a plurality of positions with respect to the target element and a radiation detector positioned so as to detect radiation emitted by the radiation source passing through the target element volume and determine a plurality of attenuation values for radiation passing through the target element to establish a radiation absorbance projection image of the target element volume for a particular radiation position, the computer program code being embodied in a computer readable medium and comprising computer program code for:

dividing the target element volume into a plurality of volume segments;

applying a reconstruction algorithm to each segment to generate a three-dimensional reconstruction of each volume segment; and

merging the three-dimensional reconstruction of each volume segment to create a three-dimensional reconstruction of the target volume.

31. The computer program of claim 30, wherein the volume segments overlap.

32. The computer program of claim 31, wherein the volume segments overlap by an amount sufficient to result in a three-dimensional reconstruction of the target volume that does not differ substantially in quality from an unsegmented reconstruction.

33. The computer program of claim 32, wherein the value of a majority of the pixels in the three-dimensional reconstruction of the target volume differ by less than about 1% from pixels in the unsegmented reconstruction.

34. The computer program of claim 31, wherein the volume segments overlap by between about 0 and 50 per cent.

35. The computer program of claim 30, wherein the volume segments comprise volume segments having a complex shape that is dependent upon the acquisition geometry and makes the reconstruction of each segment independent of the reconstruction of any other segment.

36. The computer program of claim 30, wherein the radiation source is positionable at a plurality of angles in a first plane.

37. The computer program of claim 36, wherein the volume segments comprise volume segments having a slanted rectangular shape so that the reconstruction of each segment is independent of the reconstruction of any other segment.

38. The computer program of claim 28, wherein the program code is configured to use images obtained using an image acquisition element having:

a radiation source positionable at a plurality of angles in a first plane with respect to the target element; and

a radiation detector positioned so as to detect radiation emitted by the radiation source passing through the target element and determine a plurality of attenuation value for radiation passing through the target element to establish a radiation absorbance projection image of the target element for a particular radiation source angle.

39. The computer program of claim 38, wherein the volume segments comprise volume segments having a slanted rectangular shape and having a base that corresponds to a plurality of consecutive detector pixel rows that are parallel to and spaced apart from the first plane, each slanted rectangular volume segment extending from its base in a direction toward the radiation source.

40. The computer program of claim 38, wherein the program code is configured to be deployed in mammography.

41. The computer program of claim 40, wherein the first plane is substantially parallel to a patient's chest wall.

42. The computer program of claim 41, wherein the volume segments comprise volume segments having a slanted rectangular shape and having a base that corresponds to a plurality of consecutive detector pixel rows that are parallel to and space apart from the patient's chest wall, each slanted rectangular volume segment extending from its base in a direction toward the radiation source.

43. The computer program of claim 30, wherein the program code is configured to be carried out using a plurality of processors with at least one segment reconstruction being carried out using a first processor of the plurality of processors and at least one segment reconstruction being carried out using a second processor of the plurality of processors.

44. The computer program of claim 43, wherein each segment reconstruction is carried out using a different processor of the plurality of processors.